SELF-LOCKING PIVOTAL BRACKET WITH PIVOT STOP

Technical Field of the Invention

This invention relates to a disengageable self-locking, pivotal bracket, and more specifically to such a bracket used to pivotally connect at least two members in a self-locking manner.

Background of the Invention

Connecting two elements to form an elongated device is well known in the art. Generally, a hinge is used to connect two separate elements, so that the elements can be extended to form one elongated device. While easy to construct, most of such prior art brackets are not highly regarded.

Sportfishing nets have long featured a certain type of bracket for the purpose of movably fixing one portion (the net hoop unit) to a second portion (the handle). Usually referred to as a "yoke", this specialty bracket is attached to the distal end of the net hoop unit so that it slip fits over the handle, and is releasably engaged at one end of the handle by a "snap button" type locking fastener.

While useful from the standpoint of enabling the user to slide the "nethead" up the handle in a reciprocal manner for storage purposes, this very sliding action will eventually mar the finish of the handle tube. Further, when it is time to use the net, i.e., land a fish, the fact that this type of bracket is not self-locking requires extra effort on the part of the fisherman just when time is at a premium.

Among known fishing nets, only the Dotline "Quick Draw" collapsible net features a nethead that pivots between a closed position and a self-locking open position for shipping and storage, as opposed to a

bracket that slides along the handle. The Dotline product features a pair of hoop shanks that each pivot about their own axis, to both "swing" the net open or closed and to actuate a spring-loaded plate and plunger locking mechanism.

One characteristic that the above devices and brackets have in common is that they generally require two hands to extend or unfold the elements and lock the bracket in place. For example, when using the "yoke" type disengageable lockable bracket, the user must hold the bracket in one hand, manipulate the engaging device with the other hand so that it is in the disengaged position, unfold or extend the elements, while at the same time maintaining the engaging device in the disengaged position, then release the engaging device, forming the elongated element. In addition, prior art sliding disengagable brackets are known to score and otherwise damage the finish of the tubular handles.

A need exists in the art for a simple disengageable pivotal bracket device that can be used to replace existing bracket devices. A bracket device, particularly a self-locking bracket device joining at least two members is preferable. It would also be beneficial to the user not to have to manipulate the bracket to lock it, or any of the elements, into the open, "extended" position. Rather, the user should only have to manipulate the device to disengage the locking element so that the nethead can be pivoted "backwards" into its closed configuration. The device also should be simple, inexpensive, and easy to make and use.

Summary of the Invention

The present invention is a simple disengageable self-locking, foldable, pivotal bracket device. This bracket device, particularly when used with at least two members, provides a self-locking

foldable, pivotal system that does not require the user to manipulate the bracket to lock it, or any of the elements, in position. The user need only flick or snap one of the members --similar to casting in fly fishing-- to open the elongated device and lock the bracket in place. The bracket need only be manually manipulated by the user to disengage the locking element of the bracket device so that the extended element can be closed. This device is simple, inexpensive, and easy to make and use.

More specifically, the present device includes a self-locking connecting device with a body member having a first portion and a second portion, at least one connecting element and at least one locking connector element defined in the body member for locking the device in a first (extended) position. The at least one locking connector element comprises at least one aperture, preferably having a concavity portion in proximity thereto, formed in the body member, preferably in an extended portion.

It is further contemplated that the device include a slot and at least one concave engaging portion defined in the body member at the second portion in proximity to the slot. Other elements are also contemplated, including at least one pivot aperture, at least one connecting aperture and at least one securing aperture all formed in the body member.

In another embodiment, the present invention includes the lockable device similar to that described above. This embodiment further includes a first and second member pivotally connected to the device. It is contemplated that the first member is a handle, while the second member comprises any suitable device such as a catch device, a net assembly, a grasping device or a lower support member.

In yet another embodiment of the present invention, a first member, such as a handle, and second member, such as a net assembly, are connected together by a pivotal connector that includes a stop that permits pivoting in a desired direction which facilitates a self-locking function, and yet prevents pivoting in an opposite undesired direction which might foil the self-locking function.

Numerous other advantages and features of the present invention will become readily apparent from the following detailed description of the invention, from the claims, and from the accompanying drawings.

Brief Description of the Drawings

In the drawings that form a part of the specification, and in which like numerals are employed to designate like parts throughout the same,

FIGURE 1 is a perspective view of one embodiment of the present invention in a closed, disengaged position;

FIGURE 2 is a top plan view of the bracket of FIGURE 1 depicting the members and connecting elements in phantom;

FIGURE 3 is a bottom plan view of the bracket of FIGURE 1 depicting the members and connecting elements in phantom;

FIGURE 4 is a side elevational view of the bracket of FIGURE 1 depicting the members in phantom;

FIGURE 5 is a first end elevational view of the bracket of FIGURE 1 depicting one member and connecting elements in phantom;

FIGURE 6 is a second end elevational view of the bracket of FIGURE 1 depicting the members and connecting elements in phantom;

FIGURE 7 is a side elevational view of the embodiment of FIGURE 1 in a disengaged (retracted) position;

FIGURE 8 is a side elevational view of the embodiment of FIGURES 1 and 7 in an engaged (extended) position;

FIGURE 9 is a side elevational view of an alternate embodiment of the present invention of FIGURE 1 in a disengaged (retracted) position;

FIGURE 10 is a side elevational view of the embodiment of FIGURE 9 in an engaged (extended) position;

FIGURE 11 is an elevational view of an alternate embodiment of the bracket of FIGURE 1 in accordance with the present invention;

FIGURE 12 is a first side elevational view of the bracket of FIGURE 11 depicting the members and connecting elements in phantom;

FIGURE 13 is a second side elevational view of the bracket of FIGURE 11 depicting the members and connecting elements in phantom;

FIGURE 14 is a top plan view of the bracket of FIGURE 11 depicting the members and connecting elements in phantom;

FIGURE 15 is a bottom plan view of the bracket of FIGURE 11 depicting the members and connecting elements in phantom;

FIGURE 16 is a side elevational view of an alternate embodiment of present invention of FIGURE 1 in a open position;

FIGURE 17 is a side elevational view of the embodiment of FIGURE 16 in a closed position;

FIGURE 18 is a top plan view of yet another embodiment of a pivotal connector in accordance with the present invention, shown in an extended orientation;

FIGURE 19 is a side elevational view of the pivotal connector of FIGURE 18;

FIGURE 20 is an end elevational view of the pivotal connector of FIGURE 18;

FIGURE 21 is a bottom plan view of the pivotal connector of FIGURE 18; and

FIGURE 22 is a longitudinal cross-sectional view of the pivotal connector of FIGURE 18, taken in plane 22-22 of FIGURE 18 and viewed in the direction of the arrows.

Description of the Preferred Embodiment

While this invention can be embodied in many different forms, there are shown in the drawings and described in detail, preferred embodiments of the present invention. The present disclosure is an exemplification of the principles of the invention and is not intended to limit the invention to the embodiments illustrated.

Referring to FIGURE 1 of the drawings, one embodiment of a disengageable, self-locking pivotal bracket or connector device, generally designated 10, is shown used with first and second members, generally 12 and 14 respectively, in a second (retracted) position. In the embodiment depicted in FIGURE 1, first and second members 12, 14 comprise a handle and catch device or net assembly.

Turning now to FIGURES 2 and 3, a top and bottom plan view of the device 10 of FIGURE 1 is depicted with the members 12, 14, and the connecting elements in phantom. Device 10 is preferably a simple, inexpensive, one-piece construction of metal material or glass-reinforced molded plastic that allows the user to securely mount the members 12, 14 thereto. The device 10 can be made by any method of manufacture suitable for

making metal or plastic pieces including injection molding, stamping, machining, etc.

Device 10 includes a body member 16 having a first portion 18 and second portion 20 (best seen in FIGURE 3). As shown in the FIGURE 1, device 10 includes at least one connecting element 22 and one locking connector element 24 suitable for locking the device 10 in a first (extended) position, both of which are defined in body member 16. In one preferred embodiment, connecting and locking connector elements 22, 24 are formed in body member 16 at opposite ends thereof, although other positioning of these elements is contemplated.

FIGURES 2 and 3 further reveal that body member 16 includes a U-shaped portion 26, comprised of projecting portions 28 and substantially flat support portion 30, defining at least one slot 32. While a U-shaped portion is shown and described, other configurations are contemplated, including an H-shape. Slot 32 enables device 10 to operably receive the first member 12, when device 10, and thus second member 14, are in the extended position.

Upon further inspection of FIGURE 2, it is noted that device 10 includes at least one extended portion or wing 34 having at least one beveled edge 36, joined to and integral with U-shaped portion 26 of body member 16 at first portion 18. In one preferred embodiment shown in the drawings (best viewed in FIGURE 4) device 10 includes two wings 34, each with opposing beveled edges 36, that act to further define slot 32 and receive the first member 12 when in the retracted position as shown in FIGURE 1.

As shown, projecting portions 28 are hollowed out, defining at least one bore 38 extending therethrough, acting as a connecting aperture formed in

the body member 16, whereby the second member 14 can be secured to the device 10. In the illustrated embodiment, two bores 38 are shown, each in fluid communication with beveled edge 40, opposite flat edges 41, of projecting portions 28. In addition, at least one securing aperture 42 (shown in phantom in FIGURES 2 and 3) is formed in projecting portions of body member 16 and operably associated with the bores 38.

In one preferred embodiment, securing apertures 42 are formed in each projecting portion 28. It is contemplated that the securing aperture 42 can be operably associated with a securing device 44 (shown in phantom in FIGURE 1), whereby the second member 14 can be secured to the device 10. While a bolt is shown, any type of securing device, including screws, pins, rivets, or even gluing, bonding, etc, are contemplated.

Attention is now directed to the connecting element 22 discussed briefly above. In one preferred embodiment shown in FIGURE 4, connecting element 22 comprises at least one pivot aperture 46 (shown in phantom in FIGURES 2 and 3) defined in body member 16. In one preferred embodiment, pivot apertures 46 are formed in each wing 34 of body member 16, which allows the device 10 to move in a pivotal manner about an axis defined by the aperture 46. It is further contemplated that pivot aperture 46 can operably engage a pivot device 48 (shown in phantom in FIGURE 6), operably associated with the first member 12, whereby the device 10, and thus second member 14, can move in a foldable, pivotal manner in relation to the first member 12.

While it is not necessary that device 10 be associated with either members 12 or 14, in the preferred embodiment, a pivot device 48, preferably an axial rivet, is shown in positional relationship with pivot apertures 46 so that device 10 is operably

associated with the first member 12 as shown in FIGURES 5 and 6. While an axial rivet is described, a variety of screws, pins, or other fasteners could be substituted.

Having observed the details of the connecting element 22, attention may now be given to the locking connector element 24. Returning to the side elevational view of FIGURE 4, connector element 24 of device 10 is preferably comprised of at least one aperture, a connecting aperture 50, defined in body member 16. In one embodiment, the at least one connecting aperture 50 is formed in at least one wing 34 in communication with a connecting bore 52 which in turn is in communication with slot 32 (shown in phantom in FIGURES 2 and 3).

The locking connector element 24 further comprises at least one indent or concave portion, generally designated as concave portion 54, formed in the body member 16 proximate connector aperture 50. Furthermore, at least one other indent or concavity, generally designated as concave engaging portion 56, is formed in body member 16 at second portion 20, proximate slot 32. Again it is contemplated that body member 16 include two concave portions 54 and concave engaging portions 56, where concave portions 54 are located proximate connector apertures 50 and concave engaging portions 56 are on second portion 20 located on opposing sides of slot 32.

Additionally, it is contemplated that the at least one locking connector element 24 is preferably comprised of two connecting apertures 50 each defined in wings 34 in communication with connecting bores 52 (shown in phantom in FIGURES 2 and 3). As discussed above, it is contemplated that device 10 can be used with at least two members, first and second members 12 and 14. In one preferred embodiment, locking connector

element 24, comprised of connecting apertures 50 formed in the two wings 34, is aligned and operably associated with a retaining device 58, which in turn is operably associated with first member 12.

In the embodiment shown, retaining device 58 is in a spaced relationship with the apertures 50 and comprised of a pair of opposing detent pins operably connected together by a spring device contained in first member 12. While detent pins are depicted, any type of retractable or spring operated retaining device, including snap buttons, pins, detent balls, etc. is contemplated. Retaining device 58 operably engages apertures 50 when the device 10 and second member 14 are in the first (extended) position.

As provided above, two concave portions 54 are formed in the wings 34 of body member 16 proximate connector apertures 50, in addition to two concave engaging portions 56 defined in body member 16 at second portion 20 proximate, and on opposing portions of, slot 32. The concave portions 50 provide a means for the user to access retaining device 58, when retaining device 58 engages the apertures 50. That is, the concave portions 54 allow the user to use his fingers to push the retaining device 58 in towards the center of first member 12 so that the retaining device 58 disengages from the connector apertures 50. This means that the second member 14 is free to move towards the disengaged position.

Concave engaging portions 56 act to operably engage the retaining device 58, so that the second member 14 can be locked in the first position. As the device 10 and second member 14 are moved towards the first (extended) position, the concave engaging portions 56 comes in contact with, and engages, the retaining device 58 so that the retaining device 58 is moved

inwards towards the center of the first member 12. As device 10 continues to move towards the engaged position, wings 34 act to maintain such inward position of the retaining device 58. When the device 10 moves to the first (extended) position, the connector apertures 50 are positionally aligned with the retaining device 58, allowing the retaining device 58 to move or spring outwards, away from the center of the first member 12, lockably engaging the device 10.

Turning now to the FIGURES 7 and 8, one embodiment of the present invention is shown comprised of at least first and second members 12 and 14, and device 10, where the second member 14 can move through approximately 180 degrees of motion with respect to the first member. FIGURES 7 and 8 depict both the second (retracted) position and the first (extended) position, respectively. It should be noted that while only two elements and one device are shown, multiple combinations thereof are contemplated so that the members and devices can be alternated to continuously fold back upon themselves in a Z- or snake-like fashion, similar to the old traditional foldable carpenter rulers.

A cursory review of FIGURES 7 and 8 shows that the first member 12 comprises a handle 60 while the second member 14 comprises a catch device. While the catch device is depicted as a net assembly 61 including net 62 and net support 64, other devices, including a holding device similar to that used to retrieve golf balls or a grasping device, are contemplated. Furthermore, the second member could comprise some additional article, including a lifting apparatus or a work piece like hand-held or power tools.

The self-locking device 10 as depicted is similar to that described above. Device 10 includes body member 16; first and second portions 18, 20; pivot

aperture 46 defined in body member 16 pivotally associated with first member 12; and locking connector element 24 for securing device 10 and the second member 14 in an extended position.

U-shaped portion 26 defines slot 32, whereby slot 32 operably receives first member 12 in the first (extended) position. The two extended portions or wings 34 are joined to and integral with body member 16 at first portion 18 on opposite sides of slot 32. Locking connector element 24 is comprised of two securing apertures 42, where one aperture is formed in each of the wings 34 in spaced relationship to first and second portions 18 and 20, positionally aligned with each other, and aligned and operably associated with retaining device 58.

As discussed above, retaining device 58 is preferably a detent element operably associated with first member 12 and in positional relationship with connector apertures 50, whereby retaining device 58 operably engages the apertures 50 when the device 10 and the second member 14 are in the first (extended) position.

Locking connector element 24 further comprises a concave portion 54 defined in each of the two wings 34 proximate apertures 50, so that retaining device 58 may be accessed by the user when it engages the aperture 50, and may be disengaged.

While not shown in FIGURES 7 and 8, the device 10 further includes two concave engaging portions 56 defined in body member 16 at second portion 20 proximate, and on opposing portions of, slot 32. As the device 10 and second member 14 are moved towards the first position, the concave engaging portions 56 come in contact with and engage the retaining device 58, so that the retaining device 58 is moved inward toward the

center of the first member 12. As device 10 continues to move toward the first position, wings 34 maintain the position of the retaining device 58. When the device 10 moves to the first position, the connector apertures 50 are positionally aligned with the retaining device 58, allowing the retaining device 58 to move outward, away from the center of the first member 12, lockably engaging the device 10.

Body member 16 also includes two pivot apertures 46 formed in the wings 34 that operably engage the pivot device 48 operably associated with first member 12. As described above, while many pivot devices 48 are contemplated, an axial rivet is depicted operably associated with first member 12 and in positional relationship with pivot apertures 46.

It is evident from the drawings that second member 14 could comprise a catch device or net assembly 61, including net 62 and net support 64. Net support 64 is a loop-like structure having shank portions 66 which are inserted into and engage bores 38. Securing apertures 42 are formed in each projecting portion 28 which in turn are operably associated with a securing device 44, so that the shanks 66 can be secured to the device 10. While a screw is depicted, many types of securing devices, including bolts, pins, rivets, gluing, bonding, etc. are contemplated.

Furthermore, while net assembly 61 is depicted as being relatively small with respect to handle 60, it is provided for illustrative purposes only. Any size or shaped net 62 is contemplated. Moreover, net assembly 61 could be collapsible or foldable. Additionally, while two shank portions 66 are shown, net support 64 could be formed so that only one shank portion engages the device 10 or that device 10 and net support 64 are formed as a single unit.

In operation, the user manually grasps the handle 60. The user can comfortably grasp handle 60 regardless of whether he/she is right or left handed. The user flicks or brings the handle 60 forward sharply, as if casting in fly-fishing. The force of this movement causes the second member 14 to snap forward until the second member 14 is moved approximately 180 degrees to the first (extended) position. The device 10 is then locked in place in a self-locking fashion as described above.

It should be noted that any type of handle can be used with the present invention. Turning to FIGURES 9 and 10, a second embodiment of the present invention, comprised of at least first and second members 1012 and 1014, and device 1010, where the second member 1014 can move through approximately 180 degrees of motion with respect to the first member 1012. Again, FIGURES 9 and 10 show both the second (retracted) position and the first (extended) position respectively. Furthermore, multiple combinations of the elements and devices are contemplated. Correspondingly, where appropriate, the last three digits in the 1000 series of numerals depicted in FIGURES 9 and 10 are connected to elements which have the same function and/or structure as those described with regard to FIGURES 1-8.

While device 1010 and second member 1014 are similar to those depicted in FIGURES 1, 7 and 8, first member 1012 is somewhat different. As shown, first member 1012 is generally an S-shaped hand-held element. First member 1012 includes a front portion 1068 and a rear portion 1070 which, in one preferred embodiment, are tubular and thus substantially circular in cross-section.

As shown, front portion 1068 comprises a horizontal, elongated portion 1072 which is attached to

device 1010, preferably by means of pivot aperture 1046 and pivot device 1048 similar to those described above. Rear end 1074 of the horizontal elongated portion 1072 connects the horizontal elongated portion 1072 with a substantially vertical portion 1076, which includes an upper end 1078 and a lower end 1080. The vertical portion 1076 is preferably oriented at an angle between about 100 and 140 degrees relative to the horizontal elongated portion 1072. A handgrip portion 1082, preferably comprised of plastic or rubber, is provided on substantially vertical portion 1076 to provide a gripping surface for the user.

Rear end 1074 includes a forearm engaging portion 1084 which comprise a forearm brace member 1086 and a forearm cradle member 1088. The forearm brace member 1086 includes a lower end 1090 that is connected to lower end 1080 of the vertical portion 1076. The forearm brace member 1086 terminates in an upper end 1092 that is connected to an upper end 1094 of an inner portion 1096 of the forearm cradle member 1088.

The forearm brace member 1086 is substantially parallel to the plane of the vertical portion 1076 but is slightly offset therefrom in a vertical plane as shown in FIGURES 9 and 10. The forearm cradle member 1088 includes inner portion 1096 and outer portion 1098 which together define a generally U-shaped member for receiving the forearm of the user. Upper portion 1100 of the outer portion 1098 can include an end cap 1102 to prevent any sharp edges about upper portion 1100 from scraping the skin of the user's forearm.

In operation, the hand of the user grasps the handgrip portion 1082 and the user's forearm is received within the forearm cradle member 1088 as shown in FIGURE 10. The forearm brace member 1086 comfortably engages the inner or outer surface of the user's forearm,

depending on whether the user is right or left handed. The user flicks or snaps the handle 1060 forward sharply, as if casting in fly fishing. The force of this movement causes the second member 1014 to snap forward until it is moved approximately 180 degree to the first (extended) position. The device 1010 is locked in place in a self-locking fashion as described above.

Turning now to FIGURES 11-17, yet another embodiment of the present invention is shown. Correspondingly, where appropriate, the last three digits in the 2000 series of numerals depicted in FIGURES 11-17 are connected to elements which have the same function and/or structure as those described with regard to FIGURES 1-10.

Referring now to FIGURE 11 of the drawings, an alternate embodiment of a disengageable self-locking, foldable, pivotal bracket or connector device, generally designated 2010, is shown used with a first and second members, generally 2012 and 2014 respectively, in a first (extended) position. In the embodiment depicted in FIGURE 11, first and second members 2012, 2014 comprise a handle and at least one support element.

Turning now to FIGURES 12 and 13, two side elevational views of the device 2010 of FIGURE 11 are depicted with the members 2012, 2014, and the connecting elements shown in phantom. Device 2010 is again preferably a simple, inexpensive, one-piece construction of metal or glass-reinforced plastic material that allows the user to securely mount the members 2012, 2014 thereto. The device 2010 can be made by any method of manufacture suitable for making metal or plastic pieces including injection molding, stamping, machining, etc.

Device 2010 includes a body member 2016 having a first portion 2018 and second portion 2020. As shown

in the FIGURE 11, device 2010 includes at least one connecting element 2022 and one locking connector element 2024 suitable for locking the device 2010 in both first (extended) or second (retracted) positions, both of which are defined in body member 2016.

FIGURES 11 and 12 further reveal that body member 2016 includes projecting portions 2028 and support portion 2030 (best seen in FIGURE 13), defining at least one slot 2032. While slot 2032, projecting portions 2028 and support portion 2030 are shown and described, other configurations are contemplated. Slot 2032 enables device 2010 to operably receive the second member 2014, when second member 2014 is in either the first or second positions.

Upon further inspection of FIGURES 11 and 12, it is noted that device 2010 includes at least one extended portion or wing 2034 having at least one beveled edge 2036 joined to and integral with projecting portions U-shaped portion 2026 of body member 2016 at first portion 2018. In one preferred embodiment shown in the drawings (best viewed in FIGURE 12), device 2010 includes two wings 2034, each with opposing beveled edges 2036, that act to further define slot 2032 and receive the second member 2014 when in either the first or second position as shown in FIGURES 16 and 17.

As shown, slot 2032 also acts as a connecting aperture whereby first member 2012 can be secured to the device 2010. Alternatively a portion of body member 2016 can be hollowed out, defining at least one bore 2038 extending therein. At least one securing aperture 2042 is defined in body member 2016 and operably associated with proximal portion 2031 of slot 2032.

In one preferred embodiment, two securing apertures 2042 are formed in body member 2016 each in fluid communication with proximal portion 2031 of slot

2032. It is contemplated the securing aperture 2042 can be operably associated with a securing device 2044 (best seen in FIGURES 11, 16 and 17), whereby the first member 2012 can be secured to the device 2010. While a rivet is depicted, any type of securing device, including pins, screws, or even gluing, bonding, etc, are contemplated.

Attention may now be paid to the connecting element 2022 discussed briefly above. In one preferred embodiment shown in FIGURE 11, connecting element 2022 comprises at least one pivot apertures 2046 (shown in phantom in FIGURES 11, 16 and 17, and in phantom in FIGURE 15) defined in body member 2016. In one preferred embodiment, one set of pivot aperture 2044 is formed in each wing 2034 of body member 2016, which allows the second member 2014 to move in a pivotal manner about an axis defined by the apertures 2046. It is further contemplated that the pivot aperture 2046 can operably engage a pivot device 2048 operably associated with the second member 2014, whereby the second member 2014 can move in a pivotal manner in relation to the first member 12.

While it is not necessary that device 2010 be associated with members 2012 or 2014, in the preferred embodiment, a pivot device 2048, preferably an axial rivet, is in positional relationship with pivot apertures 2046 so that device 2010 is operably associated with the first member 2012. Furthermore, while an axial rivet is described, any suitable device, including screws, pins, rivets, is contemplated.

Having observed the details of the connecting element 2022, attention may now be give to the locking connector element 2024. Returning to the side elevational view of FIGURE 11, locking connector element 2024 of device 2010 is preferably comprised of at least

one aperture, generally designated a connecting aperture 2050, formed in body member 2016. In one embodiment, the at least one connecting aperture 2050 is formed in at least one wing 2034 in fluid communication with slot 2032 (shown in phantom in FIGURES 12 and 14).

While not shown or contemplated for the preferred embodiment, locking connector element 2024 could further comprise at least one indent or concave portion defined in the body member 2016 proximate connector aperture 2050. Furthermore, at least one other indent or concavity could be defined in body member 2016 at second portion 2020 proximate slot 2032.

It is further contemplated that the at least one connector element 2024 is comprised of two sets of connecting apertures 2050 each formed in wings 2034 in spaced relationship to each other and in fluid communication with distal portion 2033 of slot 2032. As discussed above, it is contemplated that device 2010 can be used with at least two members, first and second members 2012 and 2014. In one preferred embodiment, locking connector element 2024, comprised of two sets of connecting apertures 2050 formed in the two wings 2034, is positionally aligned and operably associated with a retaining device 2058, which in turn is operably associated with second member 2014.

In the depicted embodiment, retaining device 2058 is shown in a spaced relationship to both sets of apertures 2050 and is comprised of a pair of opposing detent pins operably connected together by a spring device (shown in phantom in FIGURE 14) contained in second member 2014. While detent pins are depicted, any type of retractable or spring operated retaining device, including snap buttons, pins, detent balls, etc. is contemplated. Retaining device 2058 operably engages apertures 2050 (either apertures 2050A or 2050B as shown

in FIGURES 16 and 17) when second member 2014 is in either the first or second positions.

FIGURE 14 is a top plan view of the device 2010 of FIGURE 11 depicting the first (extended) position of the first and second members 2012, 2014 and various connecting elements in phantom. Furthermore, the relationship of second member 2014, wings 2034 and slot 2032 is shown in FIGURE 14. FIGURE 15 on the other hand is a bottom plan view of the device 2010 of FIGURE 11 depicting the second member 2014 and pivot aperture 2046 in phantom.

FIGURES 16 and 17 depict the first and second positions discussed above. FIGURES 16 and 17 reveal that, while first and second members 2012, 2014 can have many different embodiments, first member 2012 is depicted as handle 2060 having handgrip portion 2082 joined to device 2010 by slot 2032 and securing device 2042 as described above.

Second member 2014 is shown comprised of at least one pivoting support element 2106, herein further comprised of upper and lower support elements 2108 and 2110. While a unitary support element 2106 is contemplated, upper and lower support elements 2108 and 2110 are shown interconnected by adjustment device 2112.

As shown, lower support device 2110 is formed so that upper support device 2108 slidably fits therein. Adjustment device 2112 is comprised of a plurality of apertures 2114 formed in lower support element 2110, which can be operably engaged by a securing device 2116, which in turn operably engages a hole (not shown) formed in the distal end of upper support element 2108.

The length of support element 2106 is determined by moving upper support element 2108 in lower support element 2110 in a slidable fashion until the desired length is reached and a hole formed in upper

support element 2108 lines up with one of the apertures 2114. Securing device 2116, preferably a pin, is placed and securably positioned in the lined up hole and aperture 2114.

While not required, lower support element 2110 is depicted having a tip 2118 and an open end cap 2120. Tip 2118 is a standard rubber crutch tip that could be attached directly to the distal end of lower support element 2110 as shown or offset therefrom. Tip 2118 acts to prevent lower support element 2110 from damaging any surface it is used on. End cap 2120 is shown attached to the proximal end of lower support element 2110 and acts to prevent injury to the use by covering the end thereof.

As shown, FIGURES 16 and 17 depict self-locking device 2010 pivotally connecting first and second members 2012, and 2014. Device 2010 includes body member 2016, with first and second portions 2018, 2020; and pivot aperture 2046, pivotally associated with second member 2014, and locking connector element 2024, securing second member 2014 in both first and second positions, formed therein. Body member 2016 defines slot 2032, whereby the slot 2032 operably receives the second member 2014.

Two extended portions or wings 2043 are joined to and integral with body member 2016 at first portion 2018 which, along with body member 2016, act to define the slot 2032. A pair of apertures 2050 are formed in each of the wings 2034 in spaced relationship to each other, so that the apertures 2050 are aligned and operably associated with retaining device 2058 associated with second member 2014, which operably engage the apertures 2050.

While many retaining devices 2058 are contemplated, in one preferred embodiment retaining

device 2058 comprises a detent device operably associated with second member 2014 and in positional relationship with apertures 2050. FIGURE 16 depicts the first (extended) position, with lower support element 2110 in a position approximately 180 degrees in relation to handle 2060, with retaining device 2058 operably engaging connecting aperture 2050B. While not depicted, locking connector element 2024 could include a concave portion 2054 formed in each of the wings 2034 proximate the apertures 2050, whereby the retractable retaining device 2058 may be accessed when it operably engages the apertures 2050.

As discussed above, connecting element 2022 further comprising a pivot aperture 2046 formed in the body member 2016 in each of the wings 1034 operably engaging pivot device 2048, which is operably associated with the second member 2014. In one preferred embodiment, the pivot device 2048 comprises an axial rivet operably associated with the second member 2014 and in positional relationship with the pivot apertures 2046. This operable association allows the second member 2014 to pivot on an axis defined by the pivot apertures 2046.

First member 2012 is depicted in FIGURE 16 connected to device 2010. Proximal portion 2031 of slot 2032 acts as a connecting aperture formed in body member 2016, so that first member 2012 may be secured therein. At least two securing apertures 2043 are formed in body member 2016 in fluid communication with proximal portion 2031 and are operably associated with a securing device 2044. Preferably, securing device 2044 comprised a pair of rivets which engage the first member 2012 and securing apertures 2042, securing first member 2012 in proximal portion 2031 to the device 2010.

In the first (extended) position depicted in FIGURE 16, lower support element 2110 is positioned approximately 180 degrees away from handle 2060, with retaining device 2058 operably engaging connecting aperture 2050B. In the second (retracted) position shown in FIGURE 17, lower support element 2110 is positioned in proximity and parallel to handle 2060. In this position, retaining device 2058 operably engages connecting aperture 2050A. To move from the second to the first position, the user manually pushes retaining device 2058 inwards towards the center of the second member 2014, so that retaining device 2058 is disengaged from aperture 2050A. The second member 2014 may now be moved 180 degrees towards the first position, either manually or using the forward flicking motion described above. Additionally, an embodiment is contemplated having only one aperture 2050 (preferably 2050B) so that the manual manipulation previously described is not required.

As the second member 2014 is moved towards the first position, the retaining device 2058 comes in contact with and engage the rounded beveled edges 2036 of wings 2034 (or in one embodiment, the concave engaging portions 2056), so that the retaining device 2058 is moved inwards towards the center of the second member 2014. As the second member 2014 continues to move towards the first position, wings 2034 maintain the position of the retaining device 2058. When the second element 2014 is moved to the extended position, the retaining device 2058 is positionally aligned with the connector apertures 2050B, allowing the retaining device 2058 to move outwards, away from the center of the second member 2014, lockably engaging the second member 2014.

To move from the first to the second position, the user manually pushes retaining device 2058 inwards towards the center of the second member 2014, so that retaining device 2058 is disengaged from aperture 2050B. The second member 2014 may now be moved 180 degrees towards the second (retracted) position.

As the second member 2014 is moved towards the second (retracted) position, the retaining device 2058 again contacts and engage the rounded beveled edges 2036 of wings 2034 so that the retaining device 2058 is moved inwards towards the center of the second member 2014. As the second member 2014 continues to move towards the second position, wings 2034 maintain the position of the retaining device 2058. When the second member is moved to the second position, the retaining device 2058 is positionally aligned with the connector apertures 2050A, allowing the retaining device 2058 to move outwards, away from the center of the second member 2014, lockably engaging the second member 2014.

In operation, the user manually grasps the handle 60 as shown in FIGURE 8 or grasps the handgrip portion 1082 so that the user's forearm is received within the forearm cradle member 1088 as shown in FIGURE 10. The user flicks or brings handle 60/1060 forward sharply, as if casting in fly-fishing. The force of this movement causes the second member 14/1014 to snap forward until it is moved approximately 180 degrees towards the first (extended) position.

Concave engaging portions 56/1056 act to operably engage the retaining device 58/1058, so that the second member 14/1014 can be locked in the first position. As device 10/1010 and second member 14/1014 are moved towards the extended position, the retaining device 58/1058 comes in contact with, and engages, the concave engaging portions 56/1056 so that the retaining

device 58/1058 is moved inwards towards the center of the first member 12/1012. As device 10/1010 and second member 14/1014 continue to move towards the extended position, wings 34/1034 act to maintain such inward position of the retaining device 58/1058.

When the device 10/1010 moves to the first (extended) position, the retaining device 58/1058 is positionally aligned with the connector apertures 50/1050, allowing the retaining device 58/1058 to move or spring outwards, away from the center of the first member 12/1012, lockably engaging the device 10/1010. The device 10/1010 is then locked in place in a self-locking fashion.

As provided above, two concave portions 50/1050 are formed in the wings 34/1034 proximate connector apertures 50/1050. The concave portions 50/1050 provide a means for the user to access retaining device 58/1058, when retaining device 58/1058 is engaging the apertures 50/1050. That is, the concave portions 50/1050 allow the user to use his fingers to push the retaining device 58/1058 in towards the center of first member 12/1012 so that the retaining device 58/1050 disengages the connector apertures 50/1050. This means that the second member 14/1014 is free to move towards the second (retracted) position, which the user can do manually.

To operate the embodiment depicted in FIGURES 16 and 17, the user manually pushes retaining device 2058 inwards towards the center of the second member 2014, so that retaining device 2058 is disengaged from aperture 2050A. The second member 2014 may now be moved 180 degrees towards the first (extended) position, either manually or using the forward motion described above.

As the second member 2014 is moved towards the first position, the retaining device 2058 comes in contact with and engages the rounded beveled edges 2036 of wings 2034 (or in one embodiment, the concave engaging portions 2056), so that the retaining device 2058 is moved inwards towards the center of the second member 2014. As the second member 2014 continues to move towards the first position, wings 2034 maintain the position of the retaining device 2058. When the second member 2014 is moved to the first position, the retaining device 2058 is positionally aligned with the connector apertures 2050B, allowing the retaining device 2058 to move outwards, away from the center of the second member 2014, lockably engaging the second member 2014.

To move from the first to the second position, the user again manually pushes retaining device 2058 inwards towards the center of the second member 2014, so that retaining device 2058 is disengaged from aperture 2050B. The second member 2014 may now be moved 180 degrees towards the second (retracted) position.

As the second member 2014 is moved towards the second position, the retaining device 2058 again contacts and engage the rounded beveled edges 2036 of wings 2034 so that the retaining device 2058 is moved inwards towards the center of the second member 2014. As the second member 2014 continues to move towards the second (retracted) position, wings 2034 maintain the position of the retaining device 2058. When the second element 2014 is moved to the second (retracted) position, the retaining device 2058 is positionally aligned with the connector apertures 2050A, allowing the retaining device 2058 to move outwards, away from the center of the second member 2014, lockably engaging the second member 2014.

It is desirable that a pivotal connector according to the present invention include features that permit a second member to pivot in one direction from a first extended position toward a second folded position, but prohibit pivoting in the opposite direction from a first extended position toward a second folded position. In other words, the range of motion of the second member relative to the first member, as preferred, is limited to about 180 degrees of pivotal movement, rather than about 360 degrees of pivotal movement. Such features can assure, for example, that the second member can be folded only above the first member rather than below the first member. This presents an advantage when flicking the second member from the folded position to the extended position because the second member moves in a zone above the first member where there is no danger of hitting the ground or other surface. Such features also present an advantage by preventing the second member from over-extending, or rotating past the self-locking extended position, which might otherwise occur if the second member were flicked with excessive force.

It is also advantageous to assure that the pivotal connector pivots only in one direction between the folded position and the extended position to take advantage of the cam surfaces of the pivotal connector engaging the spring-biased detent pins. This allows the detent pins to be readily depressed as the pivotal connector is flipped from the folded to extended position, assuring that the detent pins are ready and able to spring outwardly when properly aligned with the locking bores. Therefore, the pivotal connector will readily lock in the extended orientation in a self-locking manner. If the pivotal connector were permitted to pivot in the opposite, undesired direction, the pins would not engage the cam surfaces as the second member

was flipped from the folded to the extended position, resulting in the automatic self-locking function not working reliably. These and other desirable advantages are provided by the embodiment described next.

Referring to FIGURES 18-22 of the drawings, a fifth embodiment of the present invention is illustrated, in which pivotal connector 3010 is substituted for connector device 10 of the first embodiment illustrated in FIGURES 1-8, or for connector device 1010 of the second embodiment illustrated in FIGURES 9 and 10. Elements of pivotal connector 3010 that generally correspond to elements of connector device 10 or 1010 are designated with like reference numerals in the 3000 series. Pivotal connector 3010 functions similarly to connector devices 10 and 1010, and a complete understanding of the configuration and manner of use of pivot connector 3010, to the extent not fully described below, may be had by referring to the description above of the first embodiment of FIGURES 1 - 8 and the second embodiment of FIGURES 9 and 10.

Pivotal connector 3010 connects a first member or handle 3012 to a second member or net assembly 3014 in a pivotally folding and extensible manner, and is self-locking in an extended orientation. In FIGURES 18-22, pivotal connector 3010 is shown with handle 3012 and net assembly 3014 in a first extended orientation. Handle 3012 and net assembly 3014 also can be disposed in a second folded orientation similar to the orientation depicted in FIGURE 1. Pivotal connector 3010 includes a body 3016 having a first portion 3018 that includes a pair of wings 3034 defining a slot 3032 therebetween, with handle 3012 disposed in slot 3032 with wings 3034 disposed on opposite sides of handle 3012. Pivotal connector 3010 further includes a second portion 3020 that includes a pair of barrels 3028

projecting upwardly and outwardly from wings 3034. Body 3016 further includes a flat bridge portion 3030 substantially perpendicular to and bridging between wings 3034 and barrels 3028 such that first and second portions 3018 and 3020, respectively, and flat bridge portion 3030 are disposed in a U-shape. Pivotal connector 3010 includes a pivot member 3022 pivotally connecting body 3016 to handle 3012, and a locking member 3024 for selectively locking body 3016 to handle 3012 such that handle 3012 and net assembly 3014 are locked in the first extended orientation. Wings 3034 each include a beveled edge 3036 disposed at that end of wings 3034 proximate locking member 3024. A lower edge of bridge portion 3030 is coplanar with beveled edges 3036.

Each of barrels 3028 defines a bore 3038 closed at one end and open at flat bridge portion 3030. Net assembly 3014 is received within bores 3038 and secured to each of barrels 3028 by a securing device 3044 received through a securing aperture 3042 that extends through a side wall of barrel 3028 in communication with bore 3038. Securing device 3044 engages net assembly 3014. Securing device 3044 can be a bolt, screw, pin, rivet, or the like. Alternatively, the function of securing device 3044 could be performed by adhesive or other means for bonding surfaces.

Pivot member 3022 includes pivot apertures 3046 defined through each wing 3034 of body 3016 and aligned to receive a pivot pin 3048 therethrough. Pivot apertures 3051 are defined through the side walls of handle 3012 and are aligned to receive pivot pin 3048 therethrough, thereby pivotally connecting body 3016 to handle 3012 to permit pivotal connector 3010 and net assembly 3014 to be pivoted relative to handle 3012

between the first extended orientation and the second folded orientation.

Locking member 3024 includes, in the outer surface of each wing 3034, a concave depression 3054 disposed coaxially with and communicating with a locking bore 3052 defined through wing 3034 and communicating with slot 3032. Locking member 3024 further includes a pair of opposed detent pins 3058 retractably extending transversely from a pair of aligned locking apertures 3053 defined through the side walls of handle 3012. A folded leaf spring (not shown) is disposed inside handle 3012, with each end thereof forming one of the detent pins 3058 to bias the detent pins outwardly away from each other. In the orientation shown, in which pivotal connector 3010 and net assembly 3014 are disposed in the first extended orientation relative to handle 3012, detent pins 3058 are biased outwardly and received in locking bores 3052 of wings 3034, thereby preventing pivotal connector 3010 from pivoting about pivotal member 3022 relative to handle 3012. Concave depressions 3054 provide access to detent pins 3058 by the finger and thumb of a user. The detent pins 3058 can be depressed inwardly against the bias of the leaf spring by pressure of an opposed finger and thumb, thereby disengaging detent pins 3058 from locking bores 3052 of wings 3034, permitting pivotal connector 3010 to pivot about pivotal member 3022 into the second folded orientation.

A pair of cam surfaces 3056 are defined on barrels 3028 of second portion 3020, sloping generally downwardly toward wings 3034 of first portion 3018 and inwardly toward slot 3032 defined between wings 3034. Each cam surface 3056 adjoins an inward surface of a respective wing 3034. As pivotal connector 3010 is pivoted about pivotal member 3022 from the first

extended orientation toward the second folded orientation, detent pins 3058, having previously been depressed and disengaged from locking bores 3052, slide along the inward surfaces of wings 3034 and are retained by wings 3034 in the depressed position against the spring bias of the leaf spring. As pivotal connector 3010 continues to rotate, detent pins 3058 reach cam surfaces 3056, at which point further pivoting toward the second orientation allows detent pins 3058 to ride up cam surfaces 3056 and extend outwardly under spring bias until detent pins 3056 are fully extended as they clear cam surfaces 3056. Upon reversing this motion, as pivotal connector 3010 is pivoted about pivot member 3022 from the second folded orientation toward the first extended orientation, detent pins 3058, which are fully extended under spring bias, engage cam surfaces 3056. Further rotation of pivotal connector 3010 toward the first orientation causes detent pins 3058 to be depressed inwardly against spring bias as detent pins 3058 ride down cam surfaces 3056 toward wings 3034. When detent pins 3058 reach wings 3034 they are fully depressed inwardly and are retained in their depressed position by wings 3034 as detent pins 3058 slide along the inward surfaces of wings 3034. Further rotation of pivotal connector 3010 toward the first orientation results in detent pins 3058 coming into alignment with locking bores 3052, whereupon detent pins 3058 snap outwardly under spring bias to engage and be received in locking bores 3052.

Cam surfaces 3056, in cooperation with wings 3034, locking bores 3052 and spring biased detent pins 3058, provide a self-locking action. Pivotal connector 3010 and net assembly 3014 can be moved from the second folded orientation to the first extended orientation by grasping handle 3012 and flicking it sharply as if

casting in fly-fishing, whereupon the pivotal connector 3010 and net assembly 3014 are caused to rapidly pivot about pivot member 3022 approximately 180 degrees from the second orientation to the first orientation. In the course of pivoting, detent pins 3058 engage cam surfaces 3056 and are depressed thereby. Upon further pivoting, depressed detent pins 3058 become aligned with locking bores 3052 and spring outwardly to engage locking bores 3052 to automatically lock handle 3012, pivotal connector 3010 and net assembly 3014 in the first extended orientation.

In order to assure the self-locking action described above, and to provide for the most compactly folded second orientation, it is important that pivotal connector 3010 and second member 3014 pivot in the direction described above relative to first member 3012. In other words, pivotal connector 3010 should be pivoted in the direction that causes detent pins 3058 to engage cam surfaces 3056 while pivoting between the first and second orientations. If pivotal connector 3010 were to be pivoted in the opposite direction, such that detent pins 3058 cleared wings 3034 without contacting cam surfaces 3056 of second portion 3020, while moving from the first extended orientation to the second folded orientation, flat bridge portion 3030 would abut handle 3012 before pivotal connector 3010 had pivoted a full 180 degrees, resulting in a less compactly folded device. Furthermore, once in the latter orientation, an attempt to self-lock the second member 3014 into the first extended orientation would probably fail because detent pins 3058 would engage the square edges of wings 3034 rather than cam surfaces 3056, and probably would not become depressed between wings 3034, preventing the second member 3014 from reaching the first extended and self-locked orientation.

To prevent pivotal connector 3010 from being pivoted in the wrong direction, as described immediately above, a tongue 3070, best seen in FIGURES 21 and 22, extends from flat bridge portion 3030 in a direction toward pivot member 3022. Tongue 3070 includes an abutment surface 3072 extending substantially parallel to first member or handle 3012 when pivotal connector 3010 is in the first extended orientation. Abutment surface 3072 abuts an inner "bottom" wall of handle 3012, serving as a stop to prevent pivotal connector 3010 from being pivoted in the wrong direction. Pivotal connector 3010 can, however, still be rotated in the correct direction because a notch 3074, best seen in FIGURE 21, in the opposite --or "top"-- sidewall of handle 3012 at the end nearest flat bridge portion 3030 provides clearance for tongue 3070 to pass through. For strength, tongue 3070 is wedge-shaped in section, as shown in FIGURE 22, with the wide end of the wedge integral with flat bridge portion 3030. Notch 3074 can be any size or shape, so long as clearance is provided for tongue 3070 to pass through the top sidewall of handle 3012 without interference when pivotal connector 3010 is pivoted.

In the embodiment described immediately above, the tongue 3070, by being able to pass through notch 3074 in one side of the wall of the first member 3012 and yet engage the opposite side of the wall of the first member 3012, provides the advantage that pivotal connector 3016 can pivot in a desired direction that facilitates the self-locking function, but cannot pivot in the opposite undesired direction that could foil the self-locking function.

In addition to serving as a stop to prevent the over rotation of pivotal connector 3010, tongue 3070 performs a load bearing function that reduces the strain

on the material forming the upper edges of locking bores 3052.

Although the invention has been described with reference to certain preferred embodiments, numerous modifications and variations can be made by those skilled in the art without departing from the novel spirit and scope of this invention.